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Title: DIAPHRAGM SPRING CLUTCH

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ABSTRACT:

Diaphragm spring friction clutch for motor vehicles, in which the diaphragm spring tongues (16) of the diaphragm spring (15) are provided with bent-off radial edges (17, 18) or the whole width of the tongue is bent out of the plane of the diaphragm spring (15) (Figure 4 (not shown)). The diaphragm spring tongues (16) act in operation as fan blades and deliver a cooling air current into the friction clutch (10). This cooling air current can escape through air outlet openings (19) from the clutch housing (11).

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(54) **Diaphragm spring clutch**

(57) Diaphragm spring friction clutch for motor vehicles, in which the diaphragm spring tongues (16) of the diaphragm spring (15) are provided with bent-off radial edges (17, 18) or the whole width of the tongue is bent out of the plane of the diaphragm spring (15) (Figure 4 (not shown)). The diaphragm spring tongues (16) act in operation as fan blades and deliver a cooling air current into the friction clutch (10). This cooling air current can escape through air outlet openings (19) from the clutch housing (11).

FIG.1

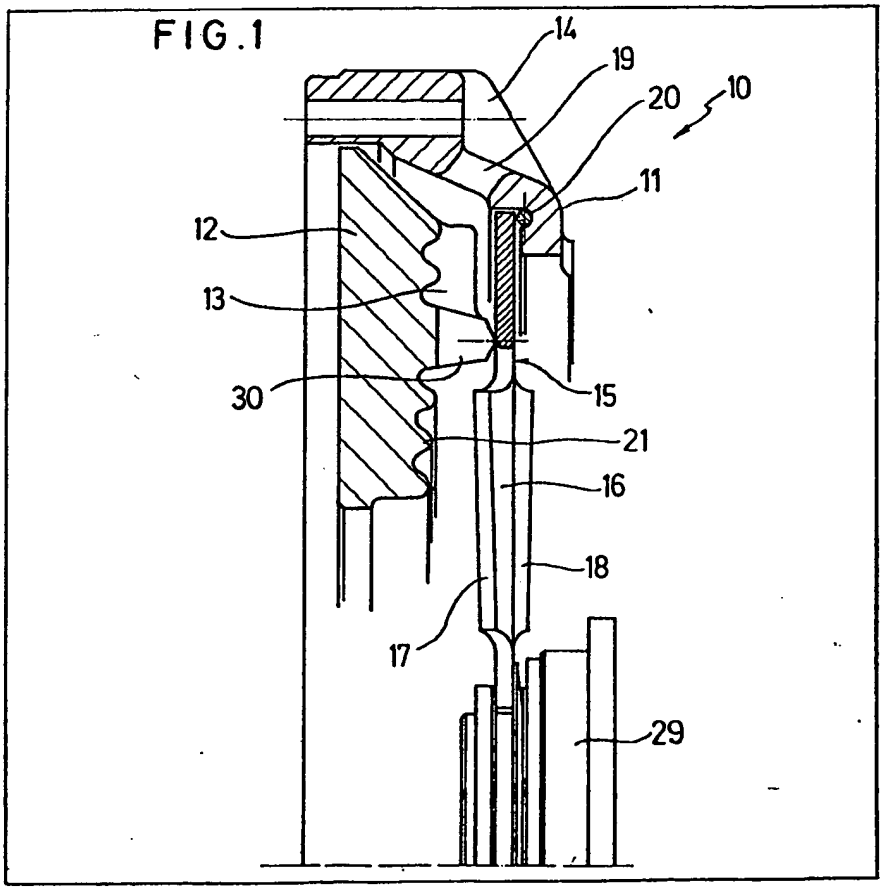

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FIG.1

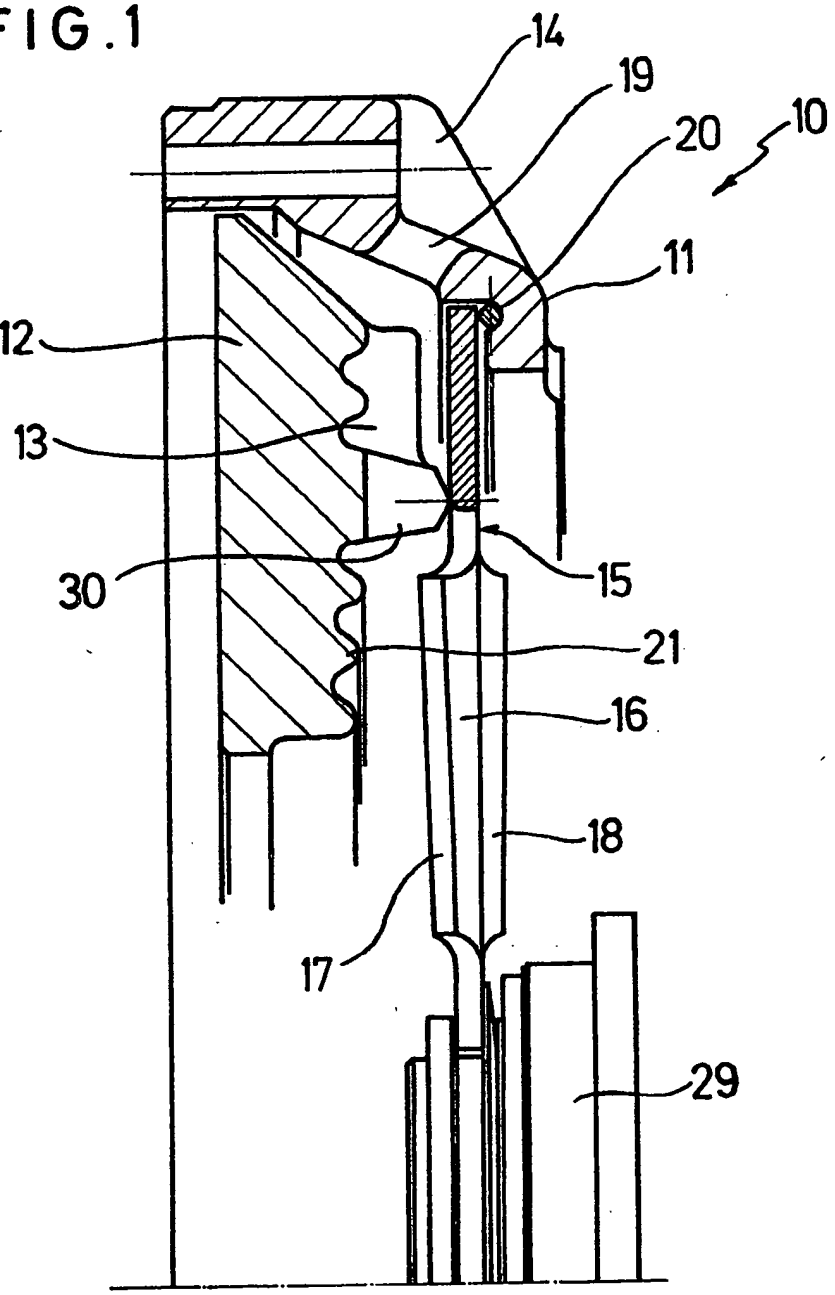


FIG. 2

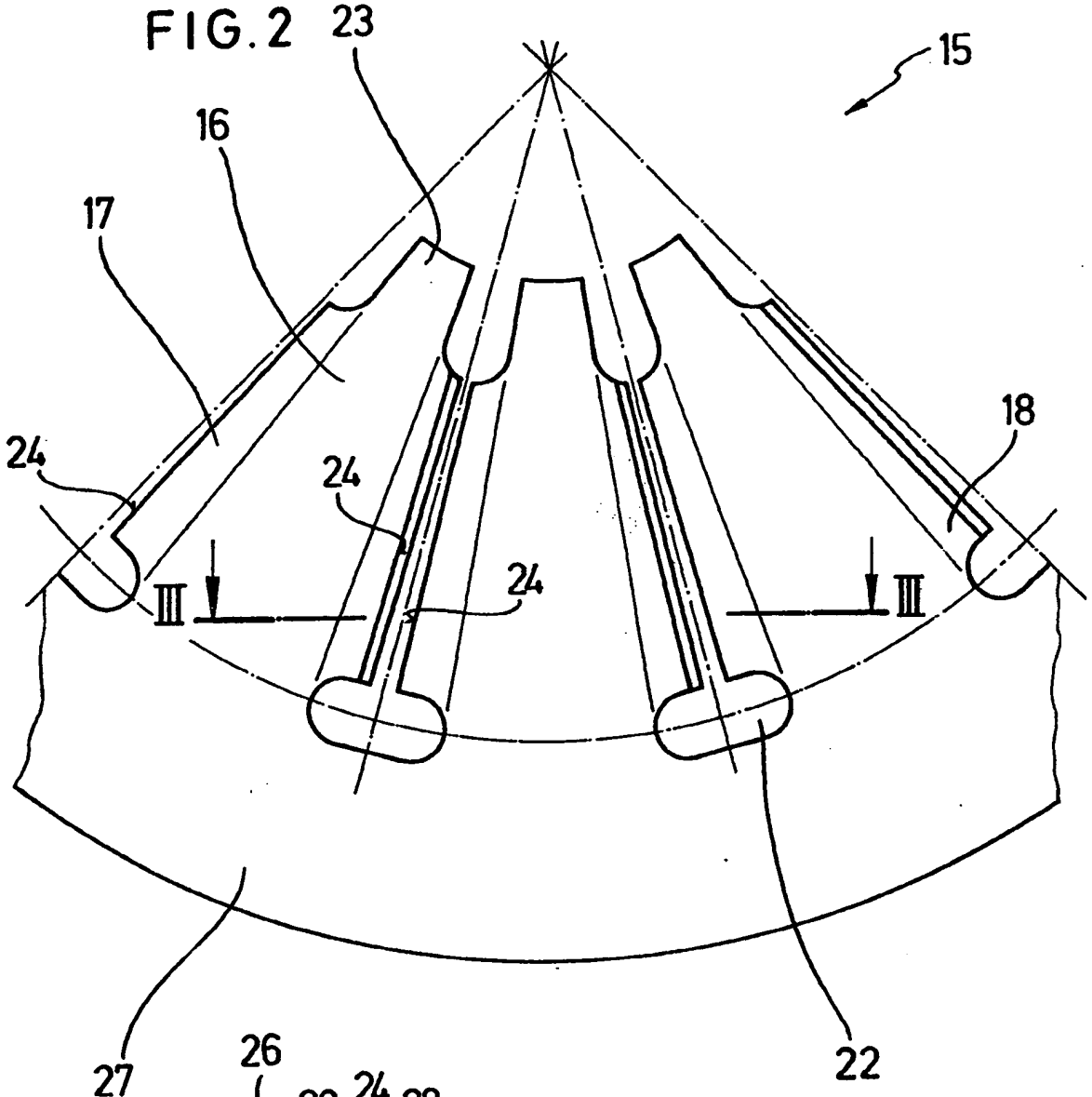


FIG. 4

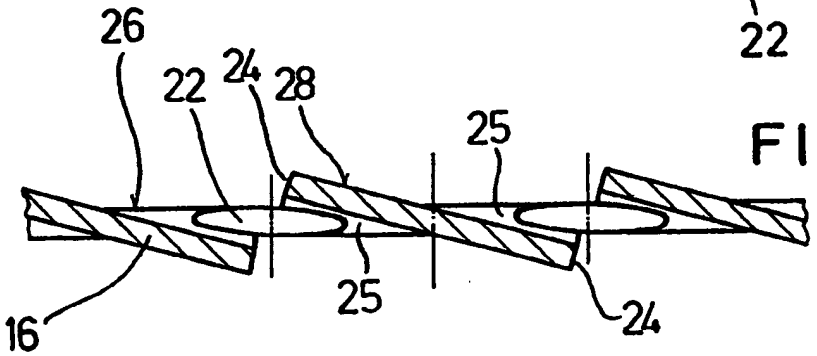
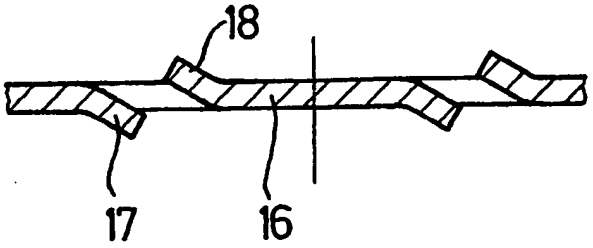


FIG. 3



SPECIFICATION

Diaphragm spring clutch

The invention relates to a diaphragm spring clutch for motor vehicles having at least one presser plate, arranged in a clutch housing and charged by a diaphragm spring provided with diaphragm spring tongues, for the application of pressure to at least one clutch disc.

Such diaphragm spring clutches serve for force transmission between the engine and the gear box of a motor vehicle. The industry is constantly endeavouring to increase the efficiency of its engines, for example by supercharging. The resultant increase of power for the same engine size results in higher engine torque. However higher engine torques produce a higher specific working loading of the existing clutches, which makes itself noticeable *inter alia* in higher temperature charging within the clutches. As experiments have shown, the clutch temperature and the wear on the friction linings of a clutch are dependent upon one another, that is to say the higher is the long-term temperature of a clutch, the more rapidly do the friction linings wear. In order that, despite the increase of engine powers, the clutches adapted to the present engine size can continue to be used, it was proposed for example by German Utility Model No. 1,988,889 to provide the clutch disc with ventilation blades and entry openings for an air flow directed on to the internal parts of the clutch. However the cooling effect achievable with such an arrangement is frequently not adequate.

It is the problem of the present invention to develop a diaphragm spring clutch of the stated classification so that an intensive cooling air current can be fed to it.

This problem is solved in accordance with the features of Claim 1. The radially inwardly directed spring tongues of the diaphragm spring are provided on their lateral edges with bent-off portions.

By these measures an air flow is directed into the clutch in a manner similar to that in an axial-flow fan. The resultant cooling of the presser plate effects a reduction of the long-term operating temperature and thus a reduction of the wear on the clutch linings. A further advantage arises out of the greater rigidity of the diaphragm spring tongues; thus the flexing of the diaphragm spring tongues in clutch disengagement becomes less and thus idle motion is avoided.

As one development of the invention it is provided that the diaphragm spring tongues are provided on their lateral edges alternately with bent-off portions directed inwards in the installed position and with bent-off portions directed outwards in the installed position. In another form of embodiment it is provided that the diaphragm spring tongues are set in the manner of saw teeth out of the plane of the diaphragm spring at a predetermined angle, the diaphragm spring tongues being inherently flat. To improve the guidance of the air flow it is further provided that the clutch housing is provided with air outlet openings in the region of its radially outer circumference.

A form of embodiment of the invention is illustrated in the accompanying drawing and will be described in greater detail below.

FIGURE 1 shows the partial section through a diaphragm spring clutch with diaphragm spring tongues configured in accordance with the invention;

FIGURE 2 shows the partial view of a diaphragm spring according to Figure 1;

FIGURE 3 shows the section through a diaphragm spring along the line III—III in Figure 2, with lateral bent-off portions on the diaphragm spring tongues;

FIGURE 4 shows the section through a diaphragm spring along the section line III—III in Figure 2, but with diaphragm spring tongues set like saw teeth.

The friction clutch 10 as illustrated in Figure 1 consists essentially of a clutch housing 11 in which a presser plate 12 can be pressed by a diaphragm spring 15 against at least one clutch disc (not shown). The clutch disc lies against a counter-pressure plate, for example the flywheel (not shown). To increase its surface area, and thus to improve the cooling, the presser plate 12 is provided with radially outwardly directed cooling fins 13 and concentrically arranged cooling grooves 21. For the better conducting away of heat the clutch housing 11 is also provided with cooling fins 14 on its radially outer circumference.

As shown by Figure 2, the diaphragm spring 15 is provided with radially inwardly directed diaphragm spring tonques 16. These diaphragm spring tongues 16 are provided on their lateral edges 24 with bent-off portions 17 and 18. The bent-off portion 17 in the installed position points inwards, that is towards the built-in presser plate 12, while the bent-off portions 18 point outwards. The bent-off portions 17 and 18 are provided in alternation on the diaphragm spring tonques 16 so that on two adjacent diaphragm spring tongues on the one side an inwardly directed bent-off portion 17 and on the other diaphragm spring tongue an outwardly directed bent-off portion 18 lie opposite to one another. The diaphragm spring tongues 16 are divided with channels 22 out of the marginal region 27 of the diaphragm spring 15 and are provided with radially inwardly lying spring tongue ends 23 which are moved axially by means of a conventional releaser 29 in the disengagement of the clutch 10 and clearing of the presser plate 12. The bent-off portions 17 and 18 begin in the channels 22 and proceed in segment manner in the direction toward the spring tongue ends 23. The spring tongue ends 23 are not bent off, and proceed in the same plane 26 as the marginal region 27 of the diaphragm spring 15. The diaphragm spring 15 lies with its radially outer marginal region 27 against a circlip 20 made fast in the clutch housing 11.

In another form of embodiment as illustrated in section in Figure 4, the diaphragm spring tongues

are set in the manner of saw teeth as a whole out of the plane 26 of th marginal region 27 f the diaphragm spring 15 by a setting angle 25. These settings begin in the channels 22 and leave the diaphragm spring tongues in a uniform plane 28 which is however turned by the setting angle 25 in relation to the plane 26 of the marginal region 27. The spring tongue ends 23 can here be oriented either in the plane 28 of the diaphragm spring tongues 16 or in the plane 26 of the marginal region 27, the latter orientation being preferred.

For better ventilation of the friction clutch 10 the clutch housing 11 is provided with air outlet openings 19 in its radially outer region. In operation the bent-off portions 17 and 18 of the diaphragm spring tongues 16 deliver an axially directed air current into the friction clutch 10, which current is deflected radially outwards on the clutch parts, for example the presser plate 12. This cooling air current sweeps over the parts to be cooled and can escape radially outwards through the air outlet openings 19. The cooling fins 13, 14, placed substantially in axial sectional planes, are arranged in the region of the air outlet openings 19 and passage openings 30 of the presser plate 12 and intensify the cooling air current, since they act as additional radial fan vanes. A better temperature mangagement in the friction clutch 10 is achieved by all these measures. The long-term operation temperature can thereby be reduced and the wear, which depends upon this long-term operation temperature, can be diminished.

CLAIMS

1. Diaphragm spring clutch for motor vehicles, having at least one clutch friction disc arranged between a presser plate (12) and a counter-pressure plate, a clutch housing (11) firmly connected with the counter-pressure plate and at l ast partially enclosing the clutch friction disc and th presser plate (12), with a diaphragm spring (15) clamping in the clutch friction disc between the presser plate (12) and the counter-pressure plate, having a releaser device (29) and ventilator vanes on one of the rotating elements of the clutch, characterised in that the diaphragm spring (15) comprises radially inwardly extending tongues (16) co-operating with the releaser device (29), which tongues are bent obliquely of the circumferential plane of the diaphragm spring (15) at least along one of their two radial tongue edges (17, 18).

2. Clutch according to Claim 1, characterised in that radial edges (17, 18) of the tongues (16) which are adjacent in the circumferential direction of the diaphragm spring (15) are bent in axially opposite directions out of the plane of the diaphragm spring (15).

3. Clutch according to Claim 2, characterised in that each tongue (16) extends in the plane of the diaphragm spring (15) between its two radial edges (17, 18) which are bent out of the plane of the diaphragm spring (15).

4. Clutch according to Claim 2, characterised in that the tongues (16) are set off from the plane of the diaphragm spring (15), at least over a part of their radial length, the set-off tongue part (28) being flat in itself.

5. Clutch according to Claim 1, characterised in that the tongues (16) are provided with apertures (22) open to the radial edge, at the transition of their radial edges (17, 18), which are bent out of the plane of the diaphragm spring (15), into a part (27) of annular disc form of the diaphragm spring (15).

6. Clutch according to Claim 1, characterised in that the free ends (23) of the tongues (16) extend parallel with the circumferential direction.

7. Clutch according to Claim 1, characterised in that the clutch housing (11) is provided with air outlet openings (19) in the region of its external circumference.

8. Clutch according to Claim 7, characterised in that the presser plate (12) is provided, on its side facing the diaphragm spring (15), with fins (13) placed substantially in axial sectional planes.

9. Clutch according to Claim 7, characterised in that the clutch housing (11) is provided, radially outside its air outlet openings (19), with fins (14) placed substantially in axial sectional planes.

10. Diaphragm spring clutch for motor vehicles substantially as described herein with reference to the accompanying drawings.

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